Energy Efficient Routing Protocols and Efficient Bandwidth Techniques in Underwater Sensor Networks

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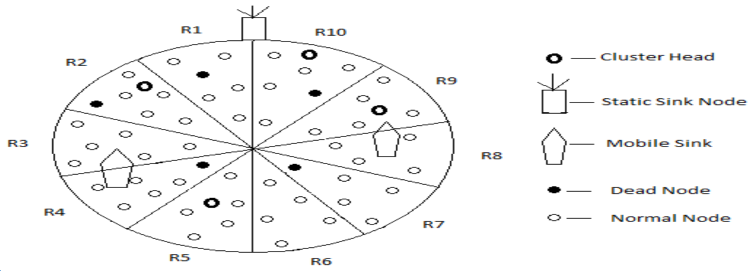
ABSTRACT

The Underwater wireless remote sensors convey messages in a range, where there is no possible human intervention. It is difficult to replace the battery and save energy in an acoustic environment, even solar energy cannot be used to energize batteries. These sensors are required to work for a long period of time, but they have constrained energy limitation. Underwater Wireless Sensor Networks (UWSN) have unpleasant surrounding which leads to high energy constraints, low bandwidth, decreased throughput, propagation delay. The speed of the sound also varies, which results in the specific loss. Combined attenuation and noise occurrence result in a typical power spectral density which leads in a decline of 18 dB in the duration of ten years. While packets are being forwarded, the energy consumption must be less or balanced, else energy holes are created. In such cases: the energy efficiency, lifetime and throughput are expanded. In this poster, we have summarized energy based routing protocols with bandwidth efficient techniques.

INTRODUCTION

UWSN are emerging nowadays for use in challenging applications such as: underwater environment monitoring, pollution monitoring, surveillance of coastal areas, and extraction of rare minerals. The sensors are dynamic and move accordingly with ocean currents. Underwater is known to be a harsh environment, where sensors may move from a particular point to an unexpected location. In underwater , radio and optical signals do not propagate and are affected by absorption loss due to the acoustic signals which travel for a long distance. Considering the manufacturing cost and the large area to cover, the sensors are deployed sparsely.



Author Name	Problem/ Related Work	Objectives	Adopted Techniques	Results
Azam et al.	High overhead and congestion [1]	Adjust the bandwidth based on network traffic and congestion.	Adaptive Bandwidth adjustment.	Smartly adjust the bandwidth of its control channel by adding frequency band from the in-band channel.
Luo., et al.	Few bits achieve the perfect bandwidth and obtains the SNR [2]	Data rate maximization and system margin maximization.	Bandwidth efficient bit loading algorithm and Lloyd algorithm.	Iterative loading algorithm is an effective approach to achieve minimization of transmission power and bandwidth efficiency.
Huang et al.	Unpredictable ambient noise for variant distances [3]	To optimize the transmission energy utilization by feeding back the optimal bandwidth value from the receiver to the transmitter for the different distance settings.	Energy efficient aggregation bandwidth for selection method.	Aggregation bandwidth using carrier aggregation has an optimal value to maximize the energy efficiency.
Zhao et al.	Excessive long multi-path delay spread and frequency –dependent propagation attenuation leads to severe Inter Symbol Interference(ISI) [4]	To mitigate the Inter Symbol Interference and improve the bandwidth efficiency, tracking the channel variation.	Doppler effect, time domain decision feedback equalization with the phase locked loop.	Increase the data efficiency of transmissions and significantly improves the system performance.
Zhang J. et al.	Lower bandwidth, longer propagation delay, and dynamic topology [5]	To improve packet delivery.	Opportunistic void avoidance.	Improved packet delivery ratio, less energy consumption.

CONCLUSION

This poster provides a classification of various protocols for routing and bandwidth techniques. This could constitute a platform for finding suitable routing protocol for a specific purpose. These protocols can be used for overcoming problems in Underwater Acoustic Systems.

REFERENCES

1.Azam, I., et al. *SEEC: Sparsity-aware energy efficient clustering protocol for underwater wireless sensor networks.*
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4.Zhao, X., D. Pompili, and J. Alves. *Energy-efficient OFDM bandwidth selection for underwater acoustic carrier aggregation systems.*
5.Zhang, J. and Y.R. Zheng. *Bandwidth-efficient MIMO underwater acoustic communications with frequency-domain equalization.*